

THE PUNISHMENT OF PERSISTENT VOMITING: A CASE STUDY¹

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In an attempt to control severe vomiting in a mentally retarded patient, shock was delivered after each stomach tension, a pre-vomiting response that consisted of an overt abdominal movement. Contingent shock resulted in an initial transitory increase followed by a decrease in rate of stomach tensions. There was a decrease in emitted vomitus, which resulted in a weight gain of the patient.

There are serious dangers to physical health from persistent vomiting and its consequent weight loss. In some cases, such vomiting occurs in the absence of organic antecedents, which suggests that external variables control the behavior. Two studies on vomiting (Lang and Melamed, 1969; Luckey, Watson, and Musick, 1968) indicate that aversive stimuli can be used effectively to control this behavior.

The application of an aversive stimulus requires a well-defined, discrete response such that a contingency can be specified. In non-organically based vomiting that is often observed among mental retardates, specification of the target response is often difficult because the vomiting behavior (projection of material from the mouth) is often a slow, continuously occurring response spanning up to 1.5 hr after meals without discrete onsets or offsets. It is also apparent that the emission of vomitus from the mouth is the end result of a chain of responses that originates lower in the alimentary canal. Since behavior at the beginning of a chain tends to be weaker than later components (Findley, 1962; Kelleher and Fry, 1962; Thomas, 1964; Thomas and Stubbs, 1957), punishment effects would probably be greater when delivered early in the chain. Thus, in addition to being discrete, the response selected

for the contingent aversive stimulus should also be at the beginning of the chain.

The nebulous nature of the vomiting response presents a further difficulty associated with the assessment of treatment effects. Gelfand and Hartmann (1968), in their discussion of the evaluation of behavior therapy treatment, suggest that data concerning the problem behavior should be collected during every treatment session in order to identify the precise variables controlling the subject's behavior. It would therefore be desirable to obtain continuous, within-session measures of vomiting.

In the case reported by Lang and Melamed (1969), an EMG recording apparatus was used to detect reverse peristalsis. Electric shock was applied in an avoidance paradigm; the onset and offset of the shock was contingent on the onset and offset of the EMG-defined response. Vomiting was substantially reduced as measured by a reduction in daily duration of periods during which emesis occurred.

Although Lang and Melamed's procedure was highly effective, the use of an EMG-defined response is limited by equipment availability and obfuscation of records by movement artifacts produced by active subjects. The general treatment of non-organically based vomiting would thus be facilitated if the contingency could be specified by direct observation without special apparatus. Without equipment to detect reverse peristalsis, it is especially important that a relationship is demonstrated between the response to be punished and the eventual emission of vomitus. An on-going measure of emitted vomitus could be used to establish such a relationship and facilitate the

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assessment of treatment effects. In the one other study on aversive control of vomiting, Luckey *et al.* (1968) reported successful treatment of vomiting through punishment. The punished response is not specified however; nor do the authors present pre-treatment baseline data or measures of vomiting.

The purpose of the present study was to control persistent vomiting in a severely retarded girl, whose life reportedly was endangered by loss of body weight. A technique for measuring the amount of emitted vomitus over time was explored as a means of obtaining continuous measures and establishing a relationship between vomiting (the referral problem) and stomach tensions, an overtly visible abdominal movement (selected as the target response). A punishment paradigm was employed and the immediate within-session effects of punishment on the target response and amount of vomitus was investigated.

METHOD

Subject

A 21-yr-old, severely retarded female who had been institutionalized since 2 yr age, served as the subject. Her diagnosis included mongolism and mild quadraplegia. She did not exhibit verbal behavior but appropriately responded to commands such as, "sit down" and "come here".

At the time of this study, the subject was not involved in ward programs or activities and spent most of her day in a chair. This general lack of behavior may have been in part a function of her physically weakened state.

Vomiting had been noted in the medical record as occurring after every meal during the preceding three months. There was a weight loss of 3, 4, and 6 pounds over the three months before treatment began; this constituted a serious medical danger in the opinion of the ward physician. At the beginning of this study the subject was 58.5 in. tall and weighed 74 lb.

Procedure

Since preliminary observations indicated that vomiting began after each meal and continued for approximately 1 hr, an 80-min after-meal period was selected for the experimental session. There were nine such 80-min periods, one after each meal on three consecutive days.

Immediately after completion of a meal in

the ward dining room, the subject was brought into an adjacent private room and seated in a chair and then given a glass of milk or juice, which facilitated the onset of vomiting. The subject was attired in briefs so that an observer seated to the side of the patient could observe surface abdominal activity. A towel was placed in a bib-like manner around the neck. This bib was replaced every 8 min with a fresh bib. At each bib change, the bib was removed and used to wipe off any remaining vomitus on the subject's hands and face and then was placed and sealed in a plastic bag. Each bib and plastic bag had been weighed and numbered before the experimental session. After completion of each session, the bags with bibs were re-weighed with the difference in the pre- and post-session weights constituting the measure of emitted vomitus.

Before the experimental sessions, the abdominal surface was observed in order to select a discrete response. The abdominal area was selected for observation because it was a likely site for an early antecedent in the chain leading to vomitus emission. A response—stomach tension—selected as a target candidate for the aversive contingency was a discrete abdominal movement that resembled an abrupt diaphragm breathing response.

It was decided that if observations during the experimental sessions revealed a substantial correlation between stomach tensions and emitted vomitus, the punishment of stomach tensions would be attempted as a means of controlling vomiting. Although a correlation between stomach tensions and vomitus would not demonstrate a causal relationship, the absence of such a correlation would preclude this response as a possible antecedent.

During the pre-experimental period, two experimenters simultaneously observed and independently signalled stomach tensions and obtained 100% agreement on the occurrence of the response. The bib-changing procedure was perfected in such a way that the entire operation was performed in several seconds.

There were two experimenters present during each session. One signalled the occurrence of a stomach tension and administered treatment. The other experimenter recorded data, timed intervals, and assisted in bib changing. Treatment was initiated on the twenty-fifth minute of Day-Two Lunch. Thereafter, every stomach tension was momentarily shocked

with an electric prod (Hot Shot Products Co., Model B12) held by the observer seated on the subject's side. Punishment was delivered by placing the prod contacts on the subject's thigh and momentarily pressing the control button. Shock duration was estimated to be less than 1 sec.

After completion of the three-day experimental period, a program was instituted for control of vomiting consistent with ward routine. The subject was allowed the freedom of the ward but was casually observed by ward personnel. If vomitus was found to be present, the subject was immediately confined to a chair and observed for 1 hr. If stomach tensions occurred, they were punished by ward personnel in the same manner as during the three-day experimental sessions. At least two regular ward personnel from each shift were trained to participate in the post-experimental maintenance program described above. Training consisted of didactic lectures on the principles of operant conditioning, observation of experimental procedures, and supervised experience with program procedures.

RESULTS AND DISCUSSION

The weight of emitted vomitus and number of stomach tensions are given in Fig. 1. It can be seen that pre-treatment stomach tensions and emitted vomitus were present at each session and occurred for at least 56 min after the beginning of the session. These data were consistent with the nurses' reports that vomiting occurred after each meal. Figure 1 also shows a similarity in shape of the curves for stomach tensions and vomitus and suggests a positive relationship between the two.

Declines in the rate of stomach tensions near the end of the session were always accompanied by declines in emitted vomitus. There appeared to be less correspondence at the beginning of sessions, which could represent a time lag between the onset of stomach tensions and the initial appearance of vomitus. The absolute levels of emitted vomitus and stomach tension varied considerably from session to session, which may reflect the variability of menus and amount of food ingested at each meal.

Following the first block of punishment on Day-Two Lunch, nine ($\frac{1}{8}$ -oz) units of vomitus were emitted during the remaining 48 min of the session. Comparable amounts of vomitus

in the four previous sessions were 42, 35, 70, and 43 units. As shown in Fig. 1, subsequent sessions continued to show substantial decreases or complete absence of stomach tension and vomitus. These data indicate that stomach tensions were an appropriate response for the aversive contingency. There is insufficient information, however, clearly to specify stomach tensions as an early link in the chain, although this would be suggested by the location (abdominal area).

Although the contingent shock did subsequently reduce rates of stomach tension, there was a paradoxical transitory increase in rate during the first 8-min block of punishment. As shown in Fig. 1, the addition of the punishment contingency was accompanied by 38 stomach tensions during this first block. This effect is paradoxical because punishing stimuli tend to show suppression effects within the first few applications (Azrin and Holz, 1966; Lovaas and Simmons, 1969). Similar to the present findings, both Luckey *et al.* (1968) and Lang and Melamed (1969) indicated that upward of 25 shocks were administered before substantial suppression was observed. Compared to other behavior control studies (Lovaas and Simmons, 1969; Risley, 1968; Tate and Baroff, 1966), the relatively large number of shocks delivered in vomiting-control studies could indicate that the response system involved is more resistant to punishment. Further, the unconditioned response to shock may be similar to the visceral responses that are being punished and would add to observed rates of the punished response. The transitory facilitatory effect in the present study might also be the result of an initially elicited response that is subsequently suppressed through the punishing effect of the eliciting stimulus.

Data for 25 days after completion of the experimental sessions indicated that 64 out of 75 meals were emesis-free. This can be compared to records that indicated vomiting occurred after every meal in the three months before treatment. There were, however, 11 post-treatment, after-meal periods during which vomitus occurred. After confining the subject to a chair (contingent on the presence of vomitus), there were no further stomach tensions or vomitus emissions for four of the after-meal periods. One shock resulted in complete suppression each of the remaining seven periods. It should also be pointed out that the relatively infre-

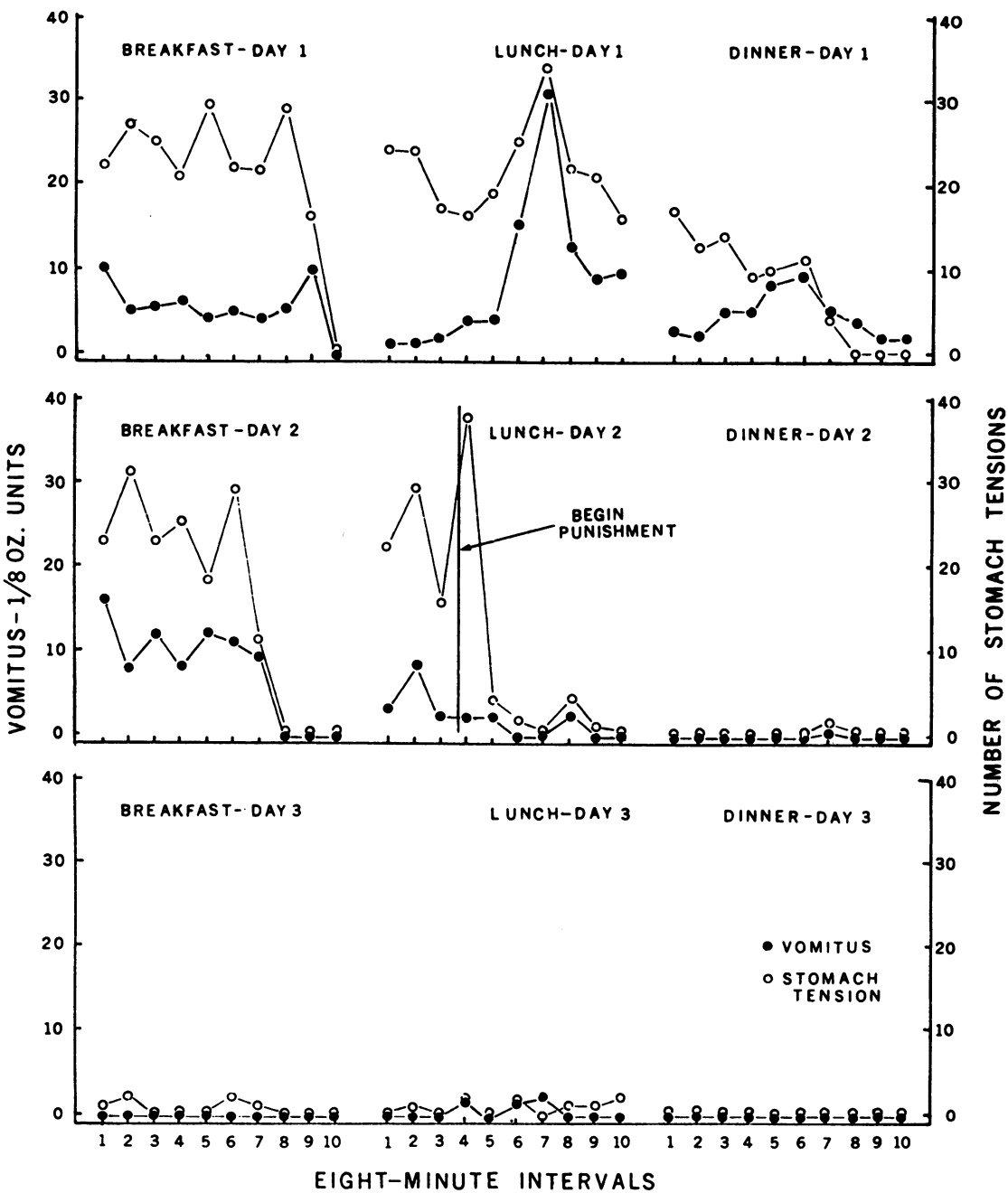


Fig. 1. Number of stomach tensions and 1/8-oz units of emitted vomitus for each 8-min interval before and after contingent shock.

quent post-treatment periods, during which vomiting occurred, appeared to be considerably less severe and to involve smaller amounts of vomitus than pre-treatment periods. The post-experimental session data given above indicate that occasional shocks were

necessary to keep the vomiting behavior under control. The program did eliminate the health hazard, as evidenced by a 10.5 lb weight gain in 25 days. Although the longer-term data were less precise than those presented to this point, it ap-

peared from informal observations that the ward program for controlling vomiting was continued for five months and both weight gains and lower frequencies of vomiting were maintained for 10 months after treatment began. Thus, there was a five-month period during which shock was not used and vomiting was controlled.

At the time of this writing, however, 1 yr since treatment began, vomiting appears to have become a problem again. Thus, the follow-up data indicate that while punishment can be an effective procedure for controlling vomiting and eliminating the health hazard, a maintenance program involving occasional shocks may be required.

REFERENCES

- Azrin, N. H. and Holz, W. C. Punishment. In W. K. Honig (Ed.), *Operant behavior: areas of research and application*. New York: Appleton-Century-Crofts, 1966. Pp. 213-270.
- Findley, J. P. An experimental outline for building and exploring multi-operant behavior repertoire. *Journal of the Experimental Analysis of Behavior*, 1962, 5, 113-166.
- Gelfand, D. N. and Hartmann, D. P. Behavior therapy with children: A review and evaluation of research methodology. *Psychological Bulletin*, 1968, 69, 204-215.
- Kelleher, R. T. and Fry, W. Stimulus functions in chained fixed-interval schedules. *Journal of the Experimental Analysis of Behavior*, 1962, 5, 167-173.
- Lang, P. J. and Melamed, B. G. Case report: avoidance conditioning therapy of an infant with chronic ruminative vomiting. *Journal of Abnormal Psychology*, 1969, 74, 1-8.
- Lovaas, O. I. and Simmons, J. Q. Manipulation of self destruction in three retarded children. *Journal of Applied Behavior Analysis*, 1969, 2, 143-158.
- Luckey, R. E., Watson, C. M., and Musick, J. K. Aversive conditioning as a means of inhibiting vomiting and rumination. *American Journal of Mental Deficiency*, 1968, 73, 139-142.
- Risley, T. The effect and side effects of punishing the autistic behaviors of a deviant child. *Journal of Applied Behavior Analysis*, 1968, 1, 21-34.
- Tate, B. G. and Baroff, G. S. Aversive control of self-injurious behavior in a psychotic boy. *Behavior Research and Therapy*, 1966, 4, 281-287.
- Thomas, J. R. Multiple baseline of stimulus functions in an FR chained schedule. *Journal of the Experimental Analysis of Behavior*, 1964, 7, 241-245.
- Thomas, J. R. and Stubbs, A. Enhancement of fixed ratio performance by briefly presented conditioned reinforcing stimuli. *Psychonomic Science*, 1966, 5, 329-330.

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